

ASSISTANT DEPUTY MINISTER (SCIENCE & TECHNOLOGY) / SOUS-MINISTRE ADJOINT (SCIENCE & TECHNOLOGIE)

# Science, Technology & Innovation for Defence & Security

Dr. Marc Fortin  
Assistant Deputy Minister (Science & Technology)  
Department of National Defence  
June 2017



## The context of defence and security is evolving....

Evolution of Warfare	Science Context is Evolving
<b>New threats</b> come from new and unpredictable adversaries (e.g. ISIL), hybrid warfare, global terrorism, etc...	<b>FROM:</b> Science & Technology has shifted from work led by defence labs (e.g. jet engine, Internet, GPS)
<b>Shifting balance of power:</b> new players, new domains, influence of non-state actors, unstable and failing states, ...	<b>TO:</b> New technological developments (e.g. quantum, synthetic biology, artificial intelligence, etc...) are not driven by government.
<b>Information</b> is an ever more important domain that supports the conduct of other types of warfare.	<b>Innovation</b> is more distributed in more organizations than before and is often led by the commercial sector.
The ability to make sense of data and process it into information is key.	Federal labs now conduct less than 8% of the research in Canada



# What does it mean for DND?

## We need to....

- **Recruit innovators** to be partners in the delivery of S&T in support of defence and security;
- Use partnerships and collaboration to foster and **leverage emerging S&T** developed across the innovation ecosystem;
- Develop a technologically advanced and **innovation-driven defence and security sector** capable of addressing evolving threats; and
- Develop deeper linkages with **like-minded countries**



# **Canada's New Defence Policy makes significant investments in innovation**

Innovation is fundamental to providing Canada with future defence and security capabilities as emerging technologies and players change the nature of conflicts and threats.

- The policy commits to investing \$1.6 billion in innovation over 20 years.
- DND to launch the Innovation for Defence Excellence and Security (IDEaS) program with this investment, to be led by ADM(S&T).
- The IDEaS program will accelerate and stimulate science and technology by capitalizing on a broader range of experts and innovators enabling us to provide DND, the CAF and security organizations with the best possible S&T solutions and advice.



## The IDEaS program will create new innovation support tools

<b>Recruiting innovators</b>	<ul style="list-style-type: none"><li>• Engage academia, industry, scientists, entrepreneurs in <b>ideation</b> to generate new concepts to challenging defence and security problems.</li><li>• Create <b>competitions and challenges</b> around key defence and security problems in order to access innovation and stimulate breakthroughs.</li></ul>
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<b>Supporting innovative ideas</b>	<ul style="list-style-type: none"><li>• Support <b>projects</b> that will allow for short term development of promising ideas.</li><li>• Create “<b>innovation networks</b>” to build a critical mass of S&amp;T expertise across academia, industry and government.</li></ul>
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**But our mission remains the same...**

***Provide DND and the CAF with an advantage in  
knowledge, technologies and solutions for  
mission success***



# What does it mean for DND?

## We need to....

- **Recruit innovators** to be partners in the delivery of S&T in support of defence and security;
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## Recent initiatives are accelerating innovation

### Support to industry

- Over 100 projects submitted by industry for up to \$80M of funding over 3 years (ADSA)
- Increased investment by companies (50:50) with 8 new DIRP projects (up to \$8M)

### Recruiting ideas

- 89 academics provided ideas for human performance in February
- Approx 140 academics applied for funding (less than \$5M)

### Demand- driven projects

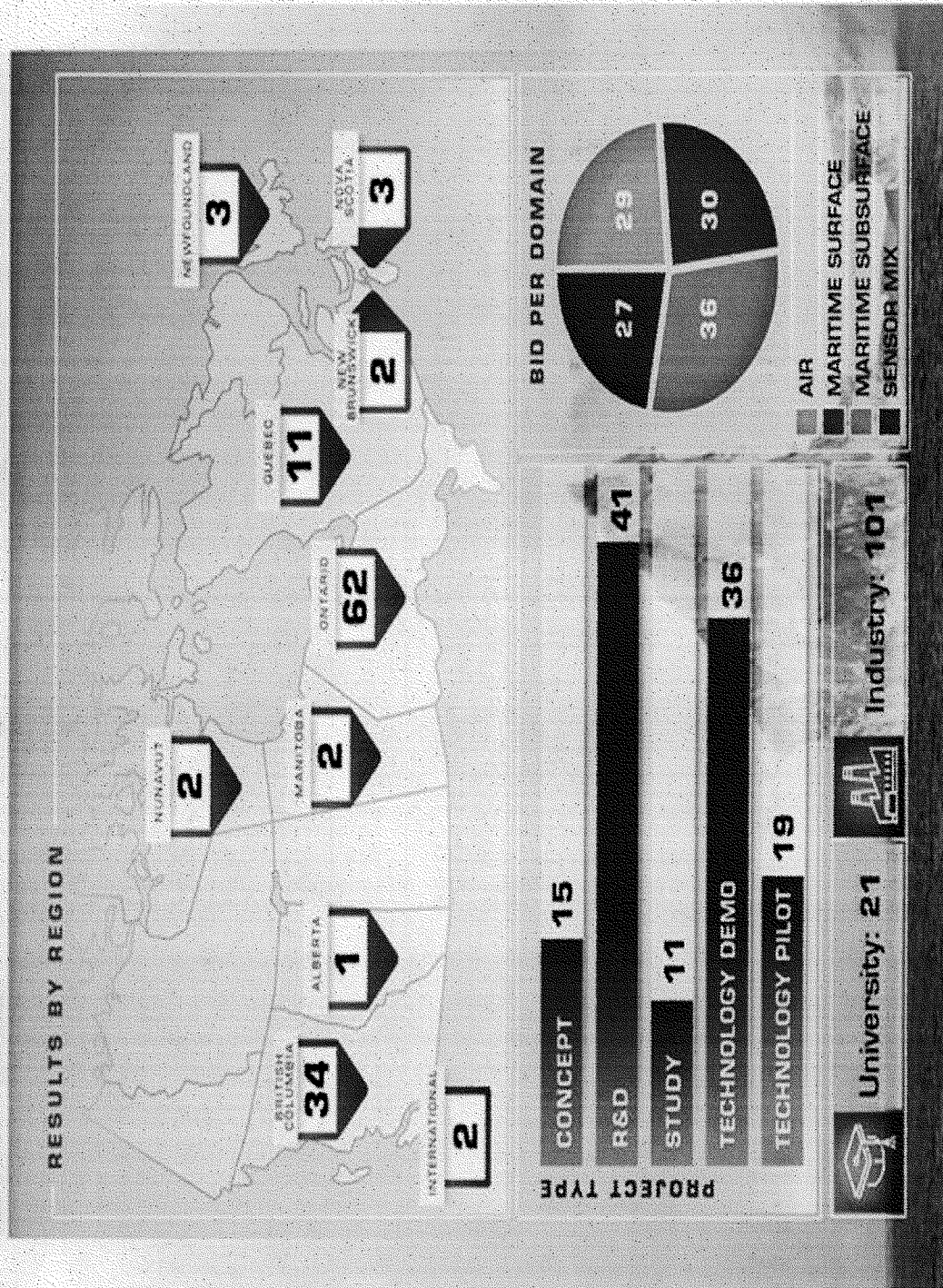
- 41 universities are part of CIMVHR (up to \$10M)
- Up to \$20M is provided to networks with the CSSP program – over 50 current networks



# Innovation Call for Proposal AD/SA S&T Program

## SOLICITATION RESULTS

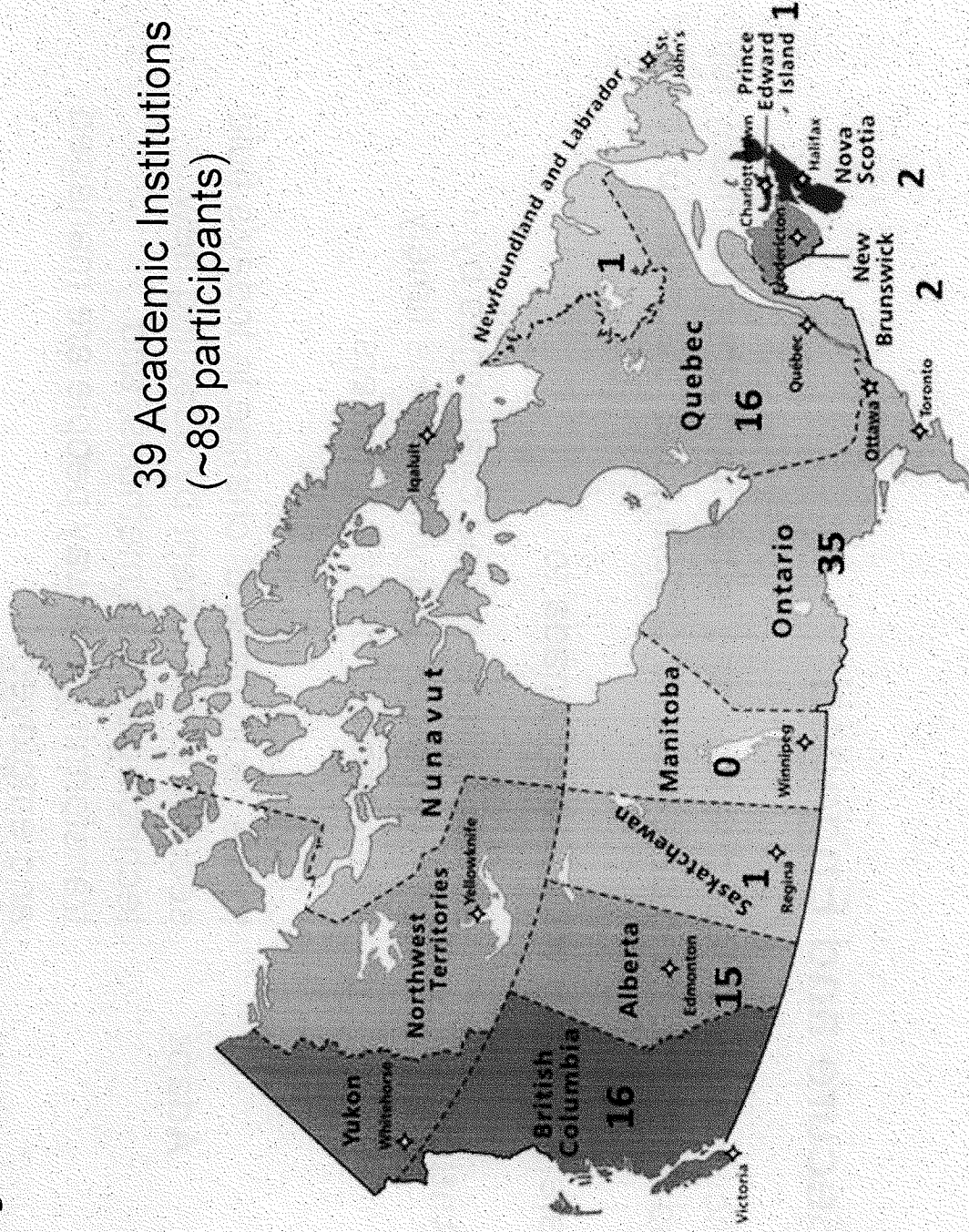
TOTAL: 122 PROPOSALS





# Human Systems Performance

39 Academic Institutions  
(~89 participants)





# **Strong, Secure and Engaged**

This new policy provides clear direction and is the foundation for many future decisions and investments in defence and security over the next 20 years.

The New Defence Policy will enable Canada to:

## **Anticipate**

emerging threats and challenges by improving our ability to provide timely information to decision makers.

## **Adapt**

to the rapid pace of change in today's fluid security environment by adopting new technologies and methods, and transforming the way people are managed and employed.

## **Act**

decisively with effective military capability by making long-term investments in the CAF.



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ASSISTANT DEPUTY MINISTER (SCIENCE AND TECHNOLOGY)

# Innovation for Defence and Security (IDeS)

Dr. Marc Fortin  
Assistant Deputy Minister (Science & Technology)  
Department of National Defence  
10 March 2017



# Global Security Environment: New Challenges

- **New threats:** New and unpredictable adversaries (e.g. ISIL), hybrid warfare, global terrorism, etc.
- **Shifting balance of power:** new players, new domains, influence of non-state actors, unstable and failing states, etc.

- **Rapid evolution of technology:** shift from innovation led by defence labs (e.g. jet engine, Internet, GPS) to innovation led by commercial sector (e.g. smart phones, robotics, advanced materials). Globalization of S&T and pace of technological development (e.g. quantum, synthetic biology, artificial intelligence, etc.) creates vulnerabilities and opportunities.



## ACCESS

**Technology and innovation is now originating outside government.  
Government needs to access these ideas at their inception to stay ahead.**



## Defence Innovation Trends of Key Allies

- The **U.S.** has launched its *Third Offset Strategy* (U.S. \$3.6 billion) aimed at leapfrogging the conventional R&D process by tapping into civilian efforts and improving collaboration with innovative private sector enterprises. The US DoD has requested a budget of US\$71.8 billion for R&D in 2017.
- **Australia** has launched the *Next Generation Technologies Fund* (\$730 million over 10 years) and a *Defence Innovation Hub* (\$640 million over 10 years) to undertake collaborative innovation activities from initial idea, through testing to application.
- The **United Kingdom** in support of Innovate UK, launched the *Defence Innovation Initiative* (£800m over 10 years).



# Lessons Learned from Allies

- Fast contracting times are necessary to keep pace with the Innovation ecosystem (in days and weeks, not months).
- Open calls for innovation generate new solutions.
- Support to innovators, both funding and expertise support, is essential for success.
- Mechanisms need to be in place to attract subject matter experts (SMEs) where most innovation takes place (e.g. 100% funding for lower TRLs, ease of requesting funding, fast contracting times since average lifespan of a start-up is one year).



# Innovation for Defence & Security (IDeS) - program drivers

## Expected outcomes:

- **Short term:** DND has an effective mechanism to seek innovative solutions to solve defence and security challenges
- **Medium term:** Canadian SMEs are increasingly engaged in solving defence and security and problems
- **Long term:** Innovation provides better CAF capabilities as well as a technological advantage.

## Key features:

- Simple, coherent and agile processes
- Demand driven: Competitions and projects are driven by the challenges identified by DND and security partners
- Bring new products into the hands of defence and security
- Policy in place to move quickly from prototype to fielding solutions



# Three levels of interventions for the IDeS initiative

<b>Recruiting innovators</b>	<ul style="list-style-type: none"> <li>engage academia, industry, scientists, entrepreneurs, ... in <b>ideation</b> labs to generate new concepts or processes</li> <li>create <b>competitions and challenges</b> around key defence and security problems in order to access innovation and stimulate breakthroughs</li> </ul>
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<b>Accelerating deployment of ideas into products</b>	<ul style="list-style-type: none"> <li>support people (and ideas) <b>mobility</b> between organizations to accelerate tapping into new knowledge and expertise</li> <li><b>share R&amp;D risks</b> where appropriate to bring innovations to market</li> <li>provide support to make projects "<b>procurement ready</b>"</li> <li>provide "<b>sandboxes</b>" to support Canadian entrepreneurs</li> <li>allow for limited procurement (<b>try and buy</b>)</li> </ul>
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## Recent initiatives that aim at accelerating innovation

### Support to industry

- Over 100 projects submitted by industry for up to \$80M of funding over 3 years (ADSA)
- Increased investment by companies (50:50) with 8 new DIRP projects (up to \$8M)

### Recruiting ideas

- 89 academics provided ideas for enhanced human performance in Feb
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### Demand- driven projects

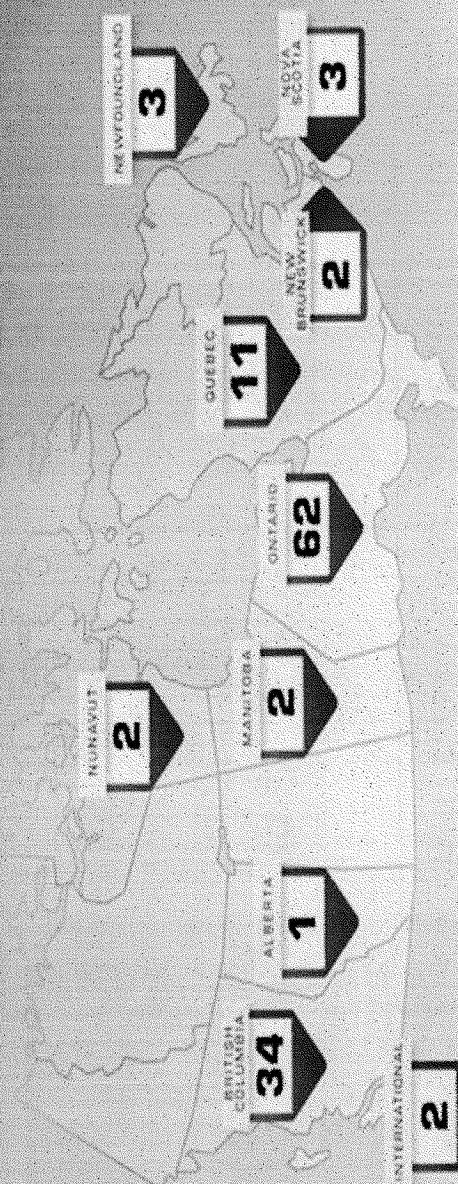
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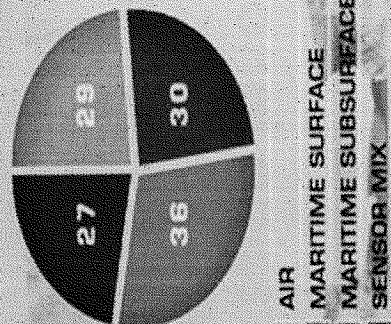
# Innovation Call for Proposal ADSA S&T Program SOLICITATION RESULTS

TOTAL: 122 PROPOSALS

## RESULTS BY REGION



## BID PER DOMAIN



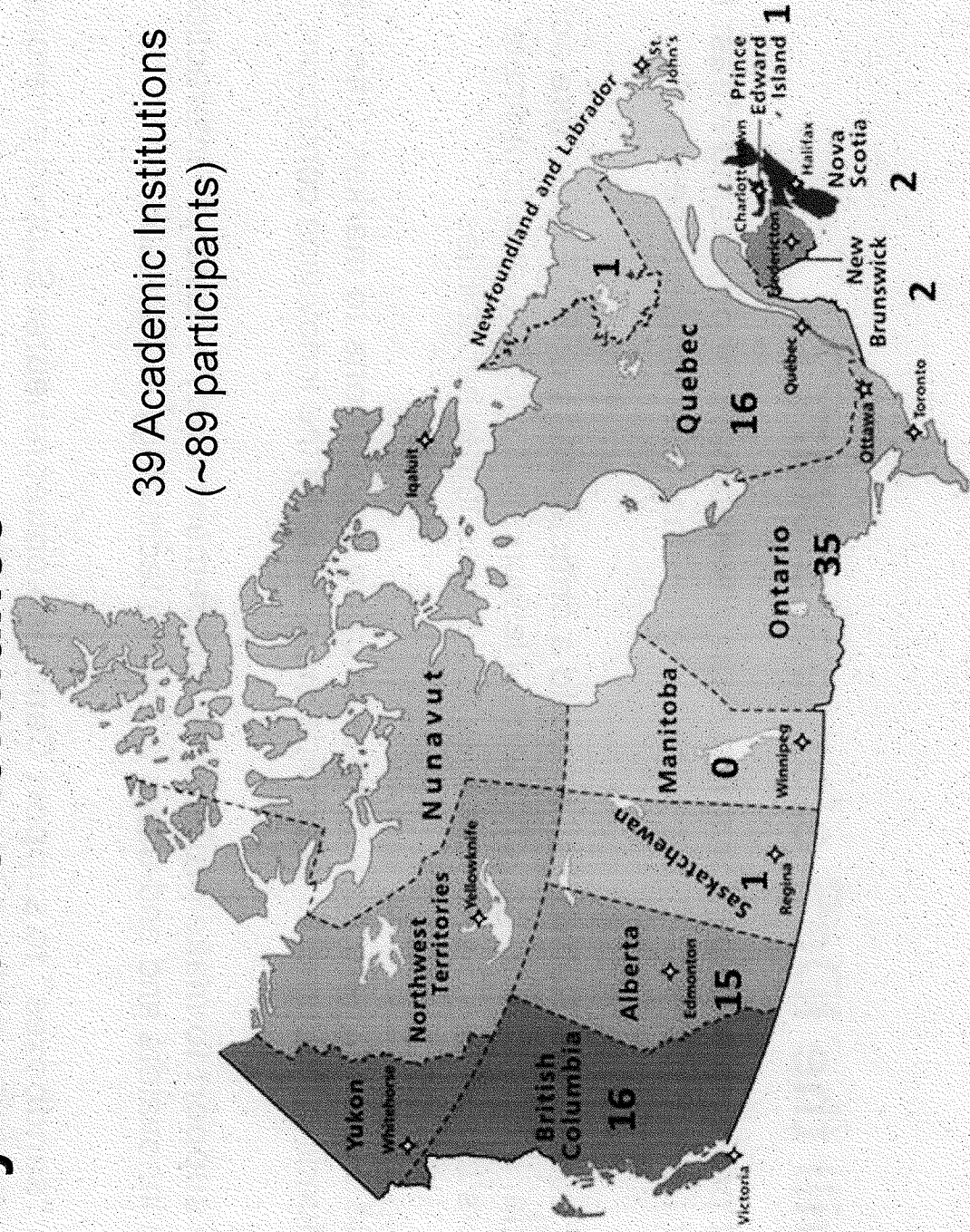
## PROJECT TYPE





# Human Systems Performance

39 Academic Institutions  
(~89 participants)





## How will the IDeS elements work?

- **Support projects to allow for short term development of promising ideas:** Fund ideas for up to 6 months - 2 years (allowing for “fast fails” where necessary).
- **Create “Innovation Networks” to build a critical mass of S&T expertise across academia, industry and government:** Networks will mobilize and coordinate innovators to address S&T challenges to address future capabilities
- **Share R&D risks where appropriate to bring innovations to market:** Offering a suite of funding instruments to provide support along the innovation continuum.
- **Provide support to make projects “procurement ready”:** catalyze interactions between innovators and end-users to enable technology exploitation.
- **Provide “sandboxes” to support Canadian entrepreneurs:** Support emerging solutions through sandbox trials, where innovators can test their technologies.
- **Allow for procurement (try and buy):** For rapid integration of new technologies or processes through support of early procurement.



## Transition to IDeS

- Previous programs to be transitioned:
  - Technology Demonstration Project (TDP) – app. \$10-20M/year
  - Technology Innovation Fund (TIF) – app. \$6-7M  
(no resource allocation in 2016-17)
- Programs to be leveraged :
  - Canadian Safety and Security Program (CSSP)
  - Defence Innovation Research Program (DIRP)
  - All Domain Situational Awareness (ADSA)



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## Potential Roll-Out of Innovation-Related Initiatives

### Q2

- Funding announcements (contracts) for the Defence Innovation Research Program for : a) Space-based technologies for surveillance [REDACTED] b) All Domain Situational Awareness contracts ([REDACTED])
- Launch of a call for proposals for the Defence Innovation Research Program for : Space-based technologies for surveillance; Naval Mine Hunting; Human Performance

### Q3

- Defence innovation (DPR related, *ad reference* to GoC decisions)
- Launch of a call for proposals for the Defence Innovation Research Program for : Power and Energy for military applications; Space-based technologies for surveillance

### Q4

- Launch of call for proposals for the CSSP program, up to \$20M
- Launch of several Defence innovation (DPR related, *ad reference* to GoC decisions) initiatives.



ASSISTANT DEPUTY MINISTER (SCIENCE AND TECHNOLOGY)

# Science, technology and innovation for defence and security

Dr. Marc Fortin  
Assistant Deputy Minister (Science & Technology)  
Department of National Defence  
March 2017



## **ADM S&T mission:**

***Provide DND and the CAF  
with a knowledge and technology advantage  
for mission success***

### **Outcomes:**

- A safe and secure Canada
- Safe and secure Canadians



# The conduct of warfare is evolving

- **New threats** come from new and unpredictable adversaries (e.g. ISIL), hybrid warfare, global terrorism, etc...
- **Shifting balance of power:** new players, new domains, influence of non-state actors, unstable and failing states, ...

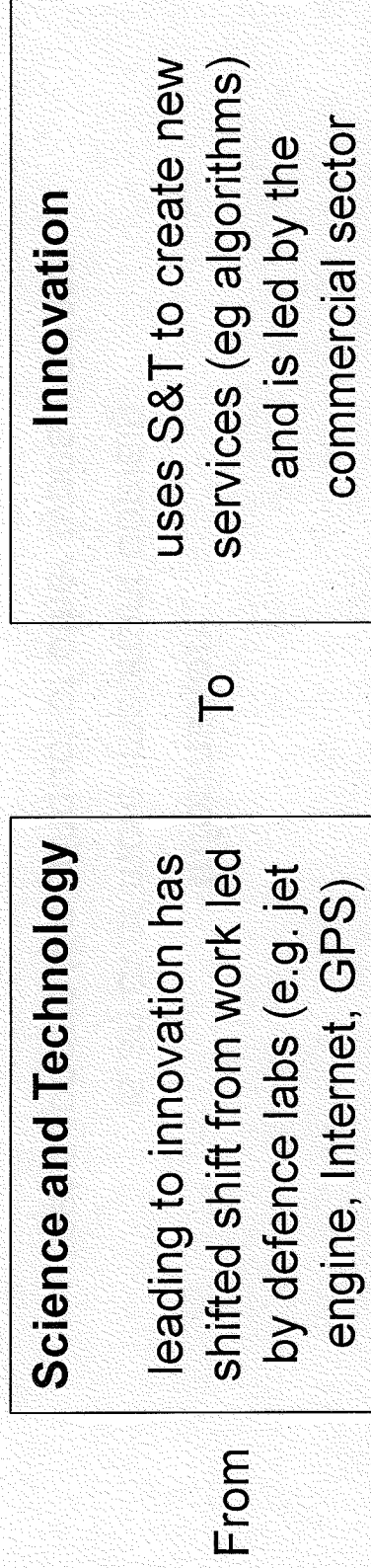
## Information

is an ever more important domain  
that supports the conduct of other types warfare

The ability to make sense of data and process it into information is key.



## And science and technology is more distributed...



... and new technological developments (e.g. quantum, synthetic biology, artificial intelligence, etc...) are not driven by government.

Federal labs now conduct less than 8% of the research in Canada



## **COLLABORATE / ACCESS**

**Technology and innovation originates mostly from  
outside government.**

**Therefore**

**Defence and security communities need to access  
these ideas at their inception to stay ahead.**

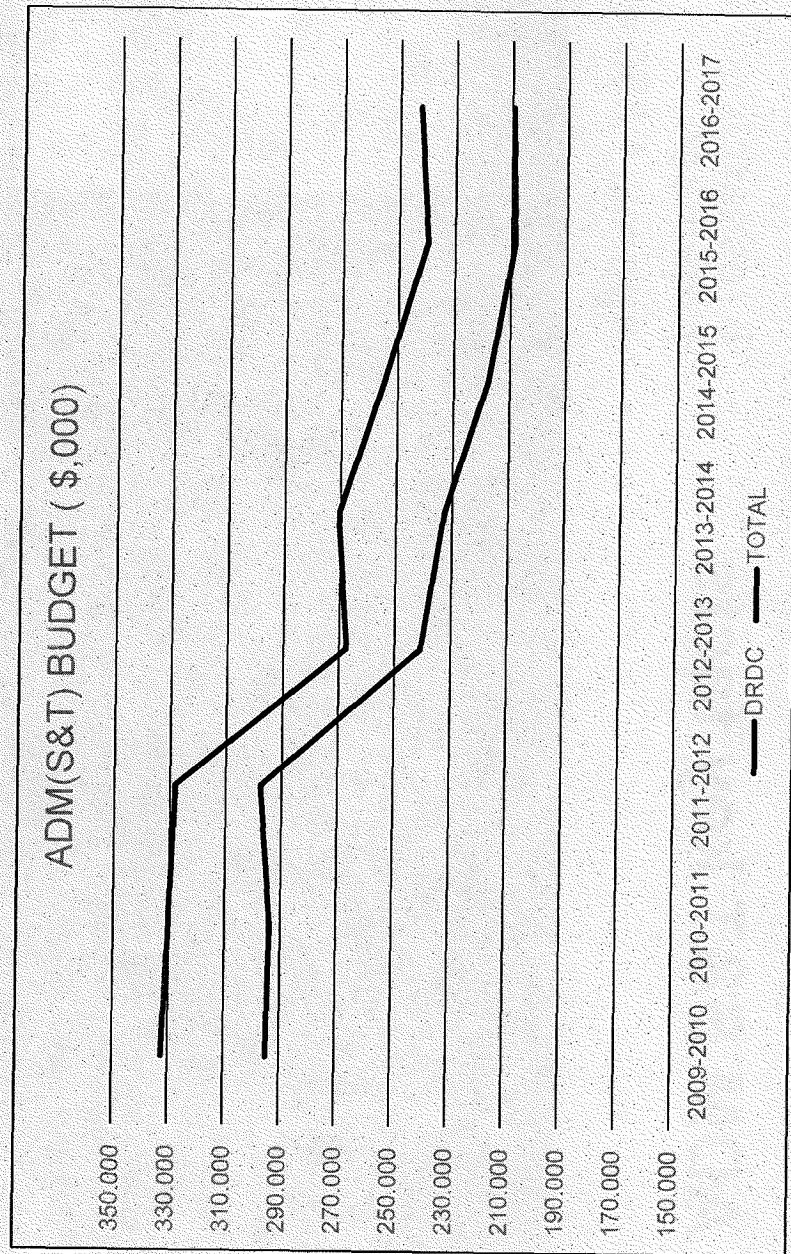


## Canada's S&amp;T / Innovation Ecosystem (2017)





# Evolving resources....



## FTE evolution

2011 – 1767 FTES  
2016 – 1364 FTES



## ADM S&T key facts

- 8 research centres located in 4 provinces
- Approx 1,300 employees





# National Partnerships

## OGD MOUs

- National Research Council
- Canadian Space Agency
- Natural Resources Canada
- Communications Research Canada
- Environment Canada

## Partnership Programs

- Defence Innovation Research Program (DIRP)
- DND-NSERC Research Partnership Program
- Canadian Safety and Security Program



Government

Le gouvernement

117-1177

<http://www.drddc-rddc.gc.ca/en/partnerships.page>



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# International Engagements



## Multi-Lateral Programs

The Technical Cooperation Program (TTCP) (AS, CA, NZ, UK, US)  
NATO Science and Technology Organization (NATO STO)

CBR MOU (AS, CA, UK, US)

CA- [redacted] Trilateral MOU

Classified MOUs

4 Points

RDT&E MOU - pending



## Bi-Lateral Programs

CA- [redacted] Defence S&T Bilateral & Security MOUs (TSWG & CT)

CA- [redacted] Defence S&T Bilateral

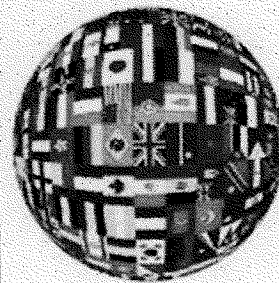
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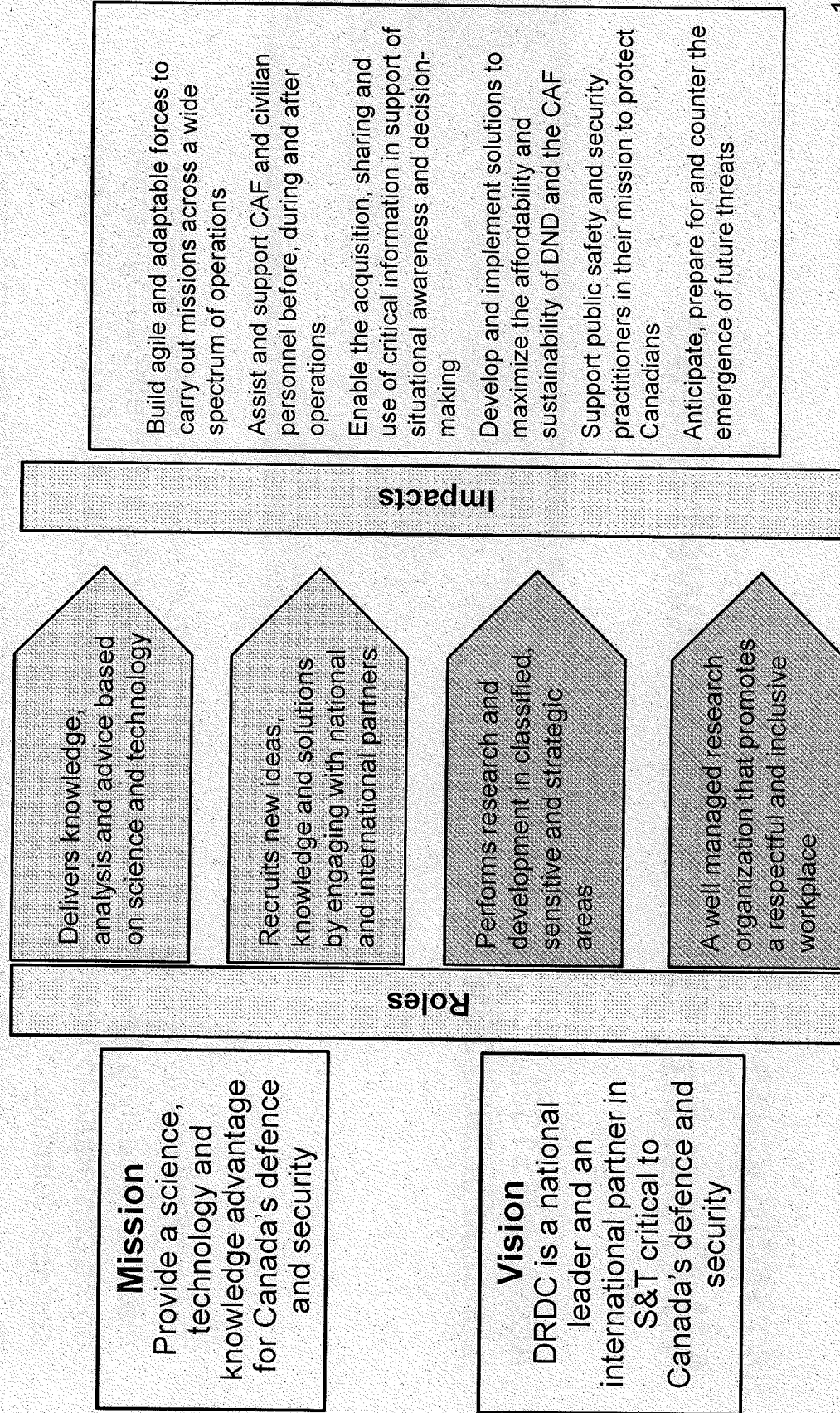
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# Knowledge is our currency

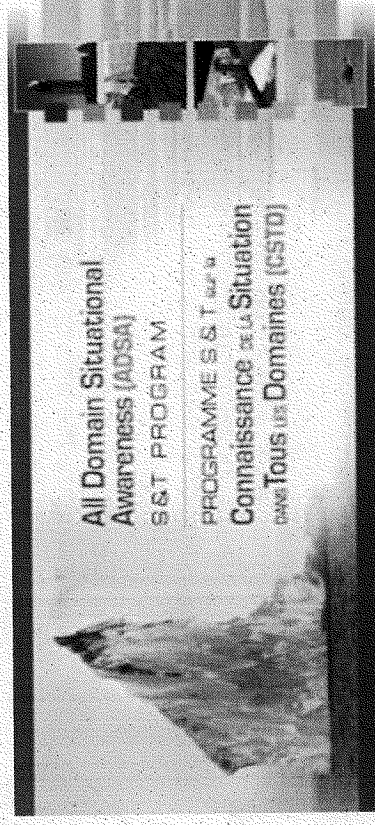




## S&T HIGHLIGHTS

# All Domain Situational Awareness

ADSA is a \$133M, 5 year program  
launched in 2015/2016



- The objective is to deliver assessments and advice on the performance and viability of existing and future concepts, technologies and methodologies that could contribute to improved awareness across air, maritime surface and sub-surface domains
- The concepts and technology solutions to be considered for the Arctic must be suitable to a remote setting subject to limited power sources, limited access and re-supply, harsh weather, limited communications and vulnerability to capture.



# The Innovation Imperative

## WHY WE MUST INNOVATE

- Nature of conflicts and threats is rapidly evolving and changing as new technologies, players and domains emerge;
- Current suite of S&T defence and security programs and investments is inadequate to address these changes ("innovation deficit");
- Must innovate to maintain defence capabilities that address current and emerging challenges; to stay ahead of rapidly evolving technology and foes; and inform future decisions; and
- Must innovate to remain economically competitive.

## HOW WE CAN INNOVATE

- **Recruit innovators** to be partners in the delivery of S&T for defence and security;
- Develop a technologically advanced and **innovation-driven defence and security sector** capable of addressing evolving threats;
- Focus on partnerships and collaboration to foster and **leverage emerging S&T** developed across the innovation ecosystem; and
- **Leverage the buying power of government** to target sectors that have the most innovative solutions.



## Aligning with Allies

- The **U.S.** has launched its *Third Offset Strategy* (U.S. \$3.6 billion) aimed at leapfrogging the conventional R&D process by tapping into civilian efforts and improving collaboration with innovative private sector enterprises. The US DoD has requested a budget of US\$71.8 billion for R&D in 2017.
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# IDeS program drivers

## Expected outcomes:

- **Short term:** DND has an effective mechanism to seek innovative solutions to solve defence and security challenges
- **Medium term:** Canadian SMEs are increasingly engaged in solving defence and security and problems
- **Long term:** Innovation provides better CAF capabilities as well as a technological advantage

## Key features:

- Simple, coherent and agile processes
- Demand driven: Competitions and projects are driven by the challenges identified by DND and security partners
- Bring new products into the hands of defence and security

*A new innovation paradigm is required due to maintain the technological advantage of the DND/CAF and security stakeholders.*



**We will innovate by...**

**Recruiting innovators**

**Supporting innovative idea**

**Accelerating deployment of ideas into product**



# We will innovate by...

## Recruiting innovators

- engaging academia, industry, scientists, entrepreneurs, ... in **ideation** labs to generate new concepts or processes
- creating **competitions and challenges** around key defence and security problems in order to access innovation and stimulate breakthroughs

## Supporting innovative ideas

## Accelerating deployment of ideas into products



## We will innovate by...

### Recruiting innovators

### Supporting innovative ideas

- supporting **projects** that will allow for short term development of promising ideas
- creating “**innovation networks**” to build a critical mass of S&T expertise across academia, industry and government
- **catalyzing** and support the incorporation of defence and security objectives into other federal programs

### Accelerating deployment of ideas into products



## We will innovate by...

### Recruiting innovators

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### Accelerating deployment of ideas into products

- supporting people (and ideas) **mobility** between organizations to accelerate tapping into new knowledge and expertise
- **sharing R&D risks** where appropriate to bring innovations to market
- providing support to make projects “**procurement ready**”
- providing “**sandboxes**” to support Canadian entrepreneurs
- supporting for procurement (**try and buy**)



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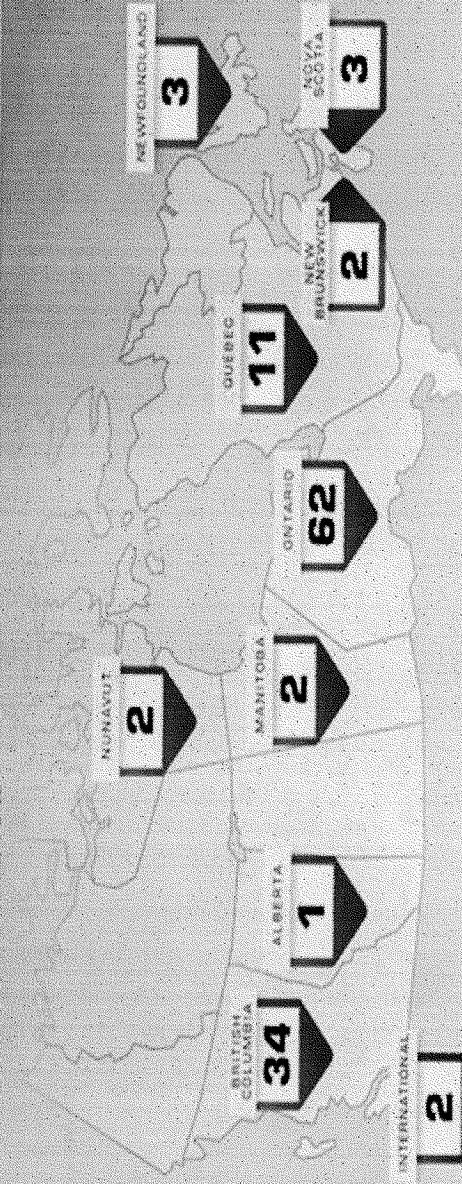
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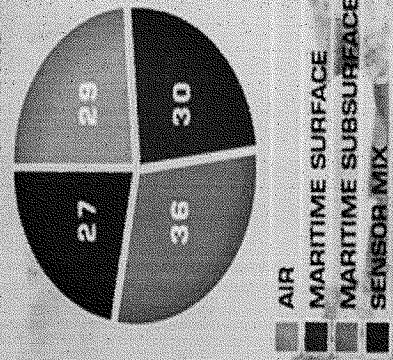
## PROJECT TYPE



University: 21

Industry: 101

## BID PER DOMAIN

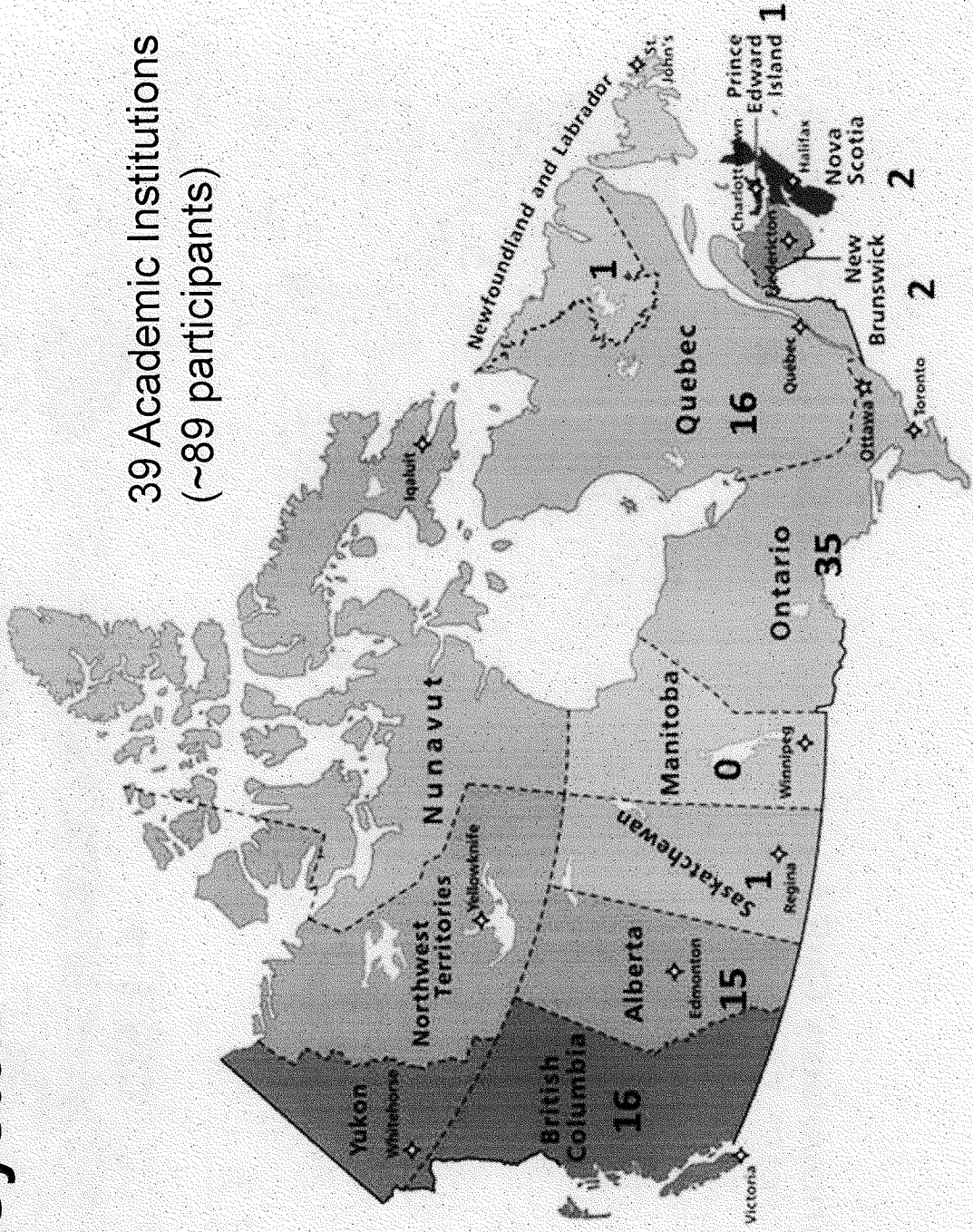


AIR  
MARITIME SURFACE  
MARITIME SUBSURFACE  
SENSOR MIX



# Human System Performance

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## How will the IDeS elements work?

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  - All Domain Situational Awareness



## The S&T program

- Is driven by requirements
  - Which the DGs of programs prioritize with the CAF
- And adds new S&T that will have an impact on future capabilities
  - Which staff contributes to the programming intake
- And focuses on what other S&T and knowledge providers can not do
- To generate trusted advice and solutions with a defence and security added value.